DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to an image heating device suitable for the anchorage device which is used for image forming devices, such as an electrophotography device and an electrostatic recording device, and is especially established in an undecidedness arrival picture, and the image forming device using this about the image heating device which shortens warming up time.
[0002]
[Description of the Prior Art]Generally as an image heating device represented by the heat fixing device, contact heating methods, such as a heat mechanical control by roller and a belt method, are used from the former.
[0003]In recent years, the belt method which can set up calorific capacity few attracts attention from the request of shortening of warm-up time, energy saving, etc.
[0004]JP,6-318001,A is the example and shows drawing 13 the structure. The belt 101 is warmed to a predetermined temperature by stretching the belt 101 which endless rotates between the fixing roller 102 and the heating roller 103, and heating the heating roller 103 by the source H1 of heating in the heating roller 103.
[0005]In this conventional example, it has intention of attaining fixing without offset with little composition of an oil application by using a belt with small calorific capacity.
[0006]The electromagnetic induction heating system with the possibility of rapid heating and efficient heating attracts attention, and JP,10-123861,A is the example and shows drawing 14 the structure. The exiting coil 114 is allocated in the inside of a heating roller, and an alternating current magnetic field is generated, an eddy current is generated in the heating roller 112, and it is made to generate heat with the core 117 constituted from this, a ferrite, etc. The pressure welding part of the heating roller 112 and the pressurizing roller 113 is made to pass the recording material 110 which carried the unestablished toner image 111, and this is fixed to it.
[0007]
[Problem(s) to be Solved by the Invention]In order to shorten warm-up time by a belt method generally also including the above-mentioned conventional example, there is an advantage that the calorific capacity of a belt can be set up small, and the belt itself can be raised in a short time to prescribed temperature. However, the tendency for belt temperature to fall very easily also becomes strong with the heat taken by the recorded material etc. when a toner image is established, so that calorific capacity is made small by

one side. It is necessary for positive fixing to return stably the belt temperature which fell at this time uniformly to a required temperature, by the time it comes to a fixing part again.

[0008]How depending on which the temperature of a belt when a still bigger technical problem passes a fixing part falls is changing a lot according to temperature states, such as a recorded material at that time, and a member used for a force means. Whether these temperature states are what kind of cases or how depending on which the belt temperature after passing a fixing part falls changes a lot, it is required to return a belt to the always optimal constant temperature for fixing, when bringing a belt again to a fixing part because of stable fixing.

[0009]In order to be uniformly stabilized to a predetermined temperature and to return a belt to it, the composition of heat transfer from an exothermic part to a belt and the composition of the exothermic part itself became important, but in the image heating device of the conventional belt method, special consideration was not carried out about this point.

[0010]In order to shorten warm-up time by a belt method generally also including the above-mentioned conventional example, the calorific capacity of the film was set up small, but [therefore] there was a problem of temperature unevenness or partial overheating. This poses a still more remarkable problem, when letting a recorded material with narrow width pass continuously to the size of the width of the depth direction of drawing 12 of an image heating device. That is, since heat is rapidly taken by the recorded material, the portion along which a recorded material passes must be heated according to it, but if the portion along which a recorded material does not pass is heated similarly, since the calorific capacity of a heating element is small, temperature will rise rapidly. And hot offset will be started if it goes up unusually, and it lets a broad recorded material pass in the state.

[0011]Conversely, in order to prevent hot offset, when generation of heat is restricted, there is a possibility that the portion from which heat was taken by the recorded material may become low temperature, and may be cold offset and un-established.

[0012]This invention solves the technical problem accompanying making small calorific capacity of the image heating device of the belt method of these former.

[0013]What heats a heating roller like the 2nd conventional example of the above using induction heating, Since it is a gestalt which makes heating elements, such as a heating roller, generate heat directly by electromagnetic induction, it is supposed that thermal-conversion efficiency can be high and temperature up of the heating roller surface can be promptly carried out to fixing temperature with less electric power as compared with a halogen lamp heating method.

[0014]However, it is difficult to aim at marked warm-up shortening as compared with the conventional halogen lamp method in the composition which only carries out electromagnetic induction heating of the usual metallic roller like the above-mentioned conventional example. In order to carry out a heating up time early more, just the improve efficiency by induction heating is not enough, but it is necessary to make a roller's own calorific capacity small. If calorific capacity is made small, temperature unevenness and partial overheating will pose a problem like the case of said belt.

[0015]The problem of this temperature unevenness becomes still more remarkable when letting the recording material of small width pass continuously to the width of a heat

roller, and if it continues applying electric power in order to maintain the temperature of the center section which has heat taken by the recording material, it will cause an unusual rise in heat in few places of absorption of the heat of both ends. It leads to the damage to the bearing of both ends, etc., and this serves as partial nonuniformity of a fixed image, and poses the problem of worsening image quality.
[0016]This invention also solves the technical problem accompanying making small calorific capacity of the image heating device of the mechanical control by roller of these former.
[0017]
[Means for Solving the Problem]A force means which welds this invention by pressure to a belt and said belt, and forms nip in said hair side of belt side side in order to solve an aforementioned problem, A heating roller which has the amplitude permeability which set Curie temperature as a predetermined value, and hangs said belt movable, Have a conductive member installed inside and a magnetizing means which magnetizes said heating roller from the exterior via said belt in said heating roller, and and said conductive member, The 1st position and this 1st position are an image heating device taking the 2nd different position and an image forming device using this.
[0018]A pressurizing member which welds this invention by pressure to a heating roller which has the amplitude permeability which set Curie temperature as a predetermined value, and said heating roller, and forms nip, Having [and] a conductive member allocated in said heating roller, and a magnetizing means for which said heating roller is magnetized from the exterior of said heating roller, said conductive members are the 1st position, an image heating device, wherein this 1st position takes the 2nd different position, this, and the used image forming device.
[0019]This inventions are an image heating device which has a switching means which changes the 1st position and 2nd position of said conductive member, and an image forming device using this.
[0020]This inventions are an image heating device, wherein a conductive member is in a near position from said magnetizing means in the 1st position and is in a position far from said magnetizing means in the 2nd position, and an image forming device using this.
[0021]This inventions are an image heating device, wherein said conductive member is in the 1st position at the time of normal operation, and an image forming device using this.
[0022]This inventions are an image heating device, wherein distance from a heating roller inner surface makes said conductive member section abbreviation semicircular state which has an almost equal arc part, and an image forming device using this.
[0023]This inventions are an image heating device an arc part of said conductive member countering with said magnetizing means in the 1st position, and not countering in the 2nd position, and an image forming device using this.
[0024]This inventions are an image heating device, wherein the length of the cross direction of a conductive member is almost equivalent to magnetization width of a heating roller by a magnetizing means or is less than it, and an image forming device using this.
[0025]A conductive member is a position which opposes a recorded material, it is outside minimum width of said recorded material, and this invention is almost equivalent to the magnetization range of a heating roller, or an image heating device forming in less than it and an image forming device using this.

[0026]
[Embodiment of the Invention]Drawing 12 is a sectional view of the image forming device which used the image heating device of the example of this invention as an anchorage device. The composition and operation of this device are explained below.
[0027]1 is an electro photography photo conductor (following photoconductive drum). The surface is uniformly charged in the predetermined dark potential V0 of minus by the electrifying device 2, rotating the photoconductive drum 1 with predetermined peripheral velocity in the direction of an arrow.
[0028]3 is a laser beam scanner and outputs the laser beam modulated corresponding to the time series electrical-and-electric-equipment digital pixel signal of picture information inputted from host devices which are not illustrated, such as an image reader and a computer. Scanning exposure of the surface of the photoconductive drum 1 by which uniform electrification was carried out as mentioned above is carried out by this laser beam, a potential absolute value becomes small, an exposed part serves as light voltage VL, and an electrostatic latent image is formed in the 1st page of a photoconductive drum.
[0029]Subsequently, with the powder toner charged in minus with the development counter 4, reversal development of the latent image is carried out, and it is developed.
[0030]Had the developing roller 4a to rotate, the thin layer of the toner which had an electric charge of minus in the roller peripheral face was formed, and the development counter 4 has opposed the 1st page of the photoconductive drum, To the developing roller 4a, the absolute value is smaller than the dark potential V0 of the photoconductive drum 1, by bigger developing bias voltage than light voltage VL being impressed, the toner on the developing roller 4a transfers only to the portion of light voltage VL of the photoconductive drum 1, and a latent image is developed.
[0031]It is a photo conductor drum to a nip part with the transfer roller 13 which it is fed [transfer roller] with the one recorded material 15 at a time from the feeding part 10 on the other hand, and made this contact the photoconductive drum 1 through the resist roller pairs 11 and 12. It is sent to the suitable timing which synchronized with rotation of 1. By operation of the transfer roller 13 with which transfer bias was impressed, the toner image on the photoconductive drum 1 is transferred one by one by the recorded material 15. It dissociates from the photoconductive drum 1, the recorded material 15 which passed along the transfer section is introduced to the anchorage device 16, and fixing of a transfer toner image is performed. The recorded material 15 in which it was established and the image was fixed is outputted to the delivery tray 17.
[0032]The 1st page of the photoconductive drum after recorded material separation is made clarification in response to removal of photoconductive drum side residues, such as the transfer remaining toner, with the cleaning device 5, and the next imaging is repeatedly presented with it.
[0033]Next, the image heating device of the example of this invention is explained in detail.
[0034]Drawing 1 is a sectional view of the anchorage device as an image heating device of the 1st example of this invention.
[0035]As the belts 20 of thin meat are 50 mm in diameter, and 50 micrometers in thickness by the endless belt by which the substrate 21 becomes by polyimide resin and the section is shown in drawing 2, in order to give a mold-release characteristic to the

surface, the releasing layer 22 with a thickness of 5 micrometers of a fluoro-resin is covered. As construction material of the substrate 21, very thin metal, such as nickel manufactured by electrocasting besides being existing heat-resistant polyimide, a fluoro-resin, etc., can also be used. The surface releasing layer 22 may cover good resin and rubber of a mold-release characteristic of PTFE, PFA, FEP, silicone rubber, fluorocarbon rubber, etc. with independent or mixing. Although what is necessary is to secure only a mold-release characteristic as an object for fixing of a monochrome picture, to use as an object for fixing of a color picture, giving elasticity needs to form a desirable and in that case a little thick rubber layer.

[0036]The litz wire which bundled the thin line is used, 23 is an exiting coil as a magnetizing means, sectional shape is formed so that the belt 20 may be covered like drawing 1, and the core material 24 which comprised a ferrite is installed in a part of center and back. The core material 24 can also use the material of high magnetic permeability, such as a permalloy. Drawing 3 is the figure which looked at the transverse plane for the composition of the core material 24 and the exiting coil 23 from the direction of the belt, and along with the main core material 24, it is mostly formed covering the overall length, and as shown in a figure, the exiting coil 23 is constituted so that the magnetic flux of a heating roller which a part of core material on the back exists in a chisel, and leaks outside may be caught. 30-kHz alternating current is impressed to the exiting coil 23 from the exciting circuit 25.

[0037]The fixing roller 43 of 20 mm in diameter low-fever conductivity with which it returned to drawing 1 again, and, as for the belt 20, the surface comprised silicone rubber of the elasticity **** foam of low hardness (30 JISA), It is hung with predetermined tension between the heating rollers 44 with a diameter of 20 mm which becomes with the below-mentioned alloy, and can rotate in the direction of arrow B. The heating roller 44 comprises a magnetic material which has the high magnetic permeability which becomes with the alloy of 0.4-mm-thick iron and nickel chromium, and it is adjusted and it is manufactured so that it may become 220 degrees with the chromium amount which the Curie temperature mixes in material. The conductive member 45 which becomes with aluminum whose conductivity is higher than said heating roller 44 is formed in the inside of the heating roller 44 by the section abbreviation semicircular state which has the arc part 45a which opened the heating roller 44 and a 0.5-mm crevice. The conductive member 45 is almost the same as the magnetization range of said exiting coil 23, or it has the length of slightly short shaft orientations, and is supported by the axis 46, enabling free rotation, a phase with said exiting coil 23 is fixed to a position, and the phase has composition which can be changed by the switching means 53.

[0038]Since the heating roller 44 and the conductive member 45 are supported by the flanges 47 and 48 which comprised thermally conductive small heat-resistant resin of bakelite etc. in both ends as shown in drawing 4, it is difficult for the heat generated with the heating roller 44 to get across to the conductive member 45. The heating roller 44 is rotated by the driving means of the device main frame which is not illustrated.

[0039]In drawing 1, the pressurizing roller 49 comprises silicone rubber of the 65 hardness JISA, is welded by pressure to the fixing roller 43 via the belt 20 like drawing 1, and forms nip. The pressurizing roller 49 was supported pivotable by follower around the metallic shaft 50 in the state. The construction material of the pressurizing roller 49 may consist of heat resistant resin and rubbers, such as other fluorocarbon rubbers and a

fluoro-resin. In order to improve abrasion resistance and a mold-release characteristic to the surface of the pressurizing roller 49, resin or rubbers, such as PFA, PTFE, and FEP, may be covered with independent or mixing. As for the pressurizing roller 49, in order to prevent diffusion of heat, it is desirable to comprise a thermally conductive small material.

[0040]In this example, self-temperature control characteristics are given to this portion by composition of the above-mentioned heating roller part. Drawing 5 and drawing 6 are used for below, and the operation is explained to it.

[0041]The conductive member 45 is being fixed with the phase which the arc part 45a whose distance with said heating roller 44 is almost equal was made to counter with the exiting coil 23. Suppose that the operation which an image forming device calls normal operation and carries out warming up for the operation for which a picture is outputted to a recorded material here to the state in which normal operation is possible is called non-normal operation. Where the heating roller 44, the fixing roller 43, the pressurizing roller 49, and the belt 20 are moved by the driving means which is not illustrated probably as warming up (non-normal operation) from ordinary temperature, In the case where drove the exiting coil 23 by a 30-kHz alternating current from the frequency 25 by the exciting circuit 25, and heating is started. The magnetic flux by the magnetic field which the exothermic part 44a which countered the exiting coil 23 of the heating roller 44 is in the temperature below a Curie point, and produced with the exiting coil 23 in drawing 5 For [of the heating roller 44] magnetism, As shown in the arrow D of a figure, and D', the inside of the heating roller 44 is almost penetrated, generation disappearance is repeated, and Joule heat almost generates the induced current generated by it into a flow and its portion only in the surface of the heating roller 44 according to a skin effect.

[0042]In drawing 8, the curve mu shows here the amplitude permeability of a magnetic material and the relation of temperature which consist of an alloy of iron and nickel chromium currently used for the heating roller 44. The temperature of the material of a heating roller is expressed with a horizontal axis, and amplitude permeability is expressed with this figure to the vertical axis. When the temperature of the heating roller 44 is low, amplitude permeability shows a high value, the magnetic flux generated with the exiting coil 23 penetrates the inside of the heating roller 44 as mentioned above, most induced currents are concentrated on the surface, and temperature up of the heating roller 44 is quickly carried out with Joule heat. The figure middle point Tk expresses Curie temperature, and amplitude permeability becomes almost the same as the inside of the air above this temperature. That is, the magnetic flux generated with the exiting coil 23 penetrates the heating roller 44, and emits it also to the conductive member 45, and an induced current flows out overwhelmingly within the conductive member 45 with high conductivity.

[0043]Since amplitude permeability will decrease in drawing 6 if the exothermic part 44a of the heating roller 44 becomes near the Curie temperature, as shown in the arrow E of a figure, and E', magnetic flux emits also to the internal conductive member 45, an induced current flows out overwhelmingly within the conductive member 45 with high conductivity, since conductivity is high at this time, that is, resistance is small, if current is restricted uniformly, generating of heat will be markedly alike and will decrease, and temperature is stabilized. The depth of the portion into which the current by this skin effect flows according to calculation becomes a thickness of about 0.3 mm, when the frequency of an exciting current is 30 kHz. The thickness of the heating roller 44 is

equivalent to this skin depth, or if it is more than it, at the time of low temperature, current will almost generate it within the heating roller 44. If current frequency is raised, so much, a skin depth becomes small and can use so thin a heating roller. However, if frequency of an exciting current is made not much high, it will require cost, and the noise which comes out outside also becomes large.

[0044]Like the curve mu of drawing 8, although amplitude permeability expresses the value whose about 140 degrees are almost the same, till said Curie point Tk, it draws the curve been lazy, and falls and goes from here. That is, the magnetic flux which it decreases gradually, and the quantity in which magnetic flux also penetrates the heating roller 44 in connection with it increases gradually, therefore passes along the conductive member 45 increases, and the induced current generated in the conductive member 45 increases amplitude permeability. As a result, the heating rate of a heating roller becomes slow in drops from the hit which passed over 140 degrees, and temperature is stabilized about 190 degrees.

[0045]Drawing 9 shows the heating up time of the heating roller 44, and a heating up time is expressed with a horizontal axis, and it expresses the temperature of a heating roller with a vertical axis. When the curve A expressed the heating up time in the case of the phase which the arc part 45a and the exiting coil 23 of the conductive member 45 countered as the above-mentioned explanation and passed over about 140 degrees in drawing 9, in drops, the heating rate became slow and is [from] stable about 190 degrees.

[0046]If the distance from the heating roller 44 fixes the almost fixed arc part 45a to the exiting coil 23 and the position which is not made to counter and energizes the conductive member 45 to the exiting coil 23 like drawing 7 here, When the temperature of the heating roller 44 is low, even if magnetic flux penetrates the inside of the heating roller 44 like the arrow D of a figure, and D', temperature rises and amplitude permeability falls, since distance with the arc part 45a of the conductive member 45 is far, That is, since it is out of the range of the magnetic field by the exiting coil 23, there is almost no magnetic flux which passes along the conductive member 45 like the arrow E of a figure and E', therefore most induced currents flow through the inside of the heating roller 44, and a heating rate hardly changes, either. The curve B of drawing 9 showed the case where the arc part 45a of the conductive member 45 did not counter with the exiting coil 23, in this example, the heating roller 44 went up at 190 degrees in about 14 seconds, and, also after that, the rise was continued.

[0047]When starting energization from the state where the energization to the exiting coil 23 is not made here (at the time of non-normal operation), The conductive member 45 is energized without making the 2nd position 45a, i.e., an arc part, counter with the exiting coil 23, the temperature of the heating roller 44 -- a near Curie temperature -- when it became about 190 degrees in this case and the heating up time at the time of changing the arc part 45a of (the time of normal operation) and the conductive member 45 to the 1st position 23, i.e., an exiting coil, and the position which counters was expressed, it became like the curve C of drawing 9. At this example, by the above-mentioned setting out, the heating roller went up at 190 degrees in about 15 seconds, and temperature control stable at about 190 degrees has been realized after slight overshooting.

[0048]A warm up (non-normal operation) is started with the phase (the 2nd position) which does not make the arc part 45a of the conductive member 45 counter the exiting

coil 23 by the above, If the arc part 45a of the conductive member 45 is changed to the exiting coil 23 and the phase (the 1st position) which counters when the skin temperature of the heating roller 44 rises to near the Curie temperature (at the time of normal operation), A heating up time hardly changes to the case where self-temperature control is not carried out, but the effect of the self-temperature control that regular temperature is stabilized is acquired.

[0049]Turned up the field which has the toner 35 in the recorded material 15 which had the toner image transferred with the image forming device of drawing 12 as shown in drawing 1, it was made to rush into the anchorage device constituted as mentioned above from the direction of the arrow F, and the toner on the recorded material 15 was fixed to it.

[0050]Since the heating roller itself has self-temperature control characteristics according to the above example, an exothermic part does not become an elevated temperature unusually and temperature control of the temperature almost near fixing temperature can be performed automatically. Since the conductive member has the almost same length as the magnetization width of an exiting coil, and acts to the partial temperature gradient of the depth direction of drawing 1 over the exothermic range of a heating roller and the difference of a partial exothermic effect occurs, The portion which a recorded material does not pass even if it lets a recorded material with narrow width pass continuously does not become an elevated temperature unusually, and hot offset is not carried out even if it lets a broad recorded material pass after that.

[0051]Material and thickness optimal [since the construction material, thickness, etc. of a heating roller can be independently set to a belt] in order to perform self-temperature control can be chosen, and since the calorific capacity of a belt can also be set up apart from it, the optimal value can be chosen.

[0052]On the other hand, since the fixing roller comprises foam in the top where the thermal conductivity of material itself is low, the heat generated by the belt in existence of an internal opening is what has good efficiency that it is hard to escape.

[0053]In this example, in order to attain the purpose of shortening warm-up time, while setting up the calorific capacity of a belt small as much as possible, thickness of the heating roller was made small and the calorific capacity is also set up small. Since the quantity of heat stored in a heating roller will become very small if thickness of the heating roller is made small like this example and it is set to the calorific capacity and the equivalent level of a belt in order to carry out a standup early, even if it once stores heat in a heating roller, by usual, a temperature fall will be carried out immediately. That is, in order to give sufficient quantity of heat for a belt, it is necessary to warm the heating roller itself even to a considerable high temperature by the method of once giving heat to a heating roller at other places other than a contact portion with a belt, and warming a belt by it. The belt cooled further again when passing a nip part may be cooled by greatly different temperature according to the temperature of the pressurizing roller at that time, or a fixing roller, or the temperature state of a recorded material. Therefore, in the above-mentioned method, it must be set as the temperature from which the temperature of the heating roller also differed greatly according to it.

[0054]However, in this example, since generation of heat is performed in the portion which is in contact with the belt of the heating roller and heat required for a belt is transmitted immediately, it is not necessary to make a heating roller into an elevated

temperature more than needed. Since there is almost no generation of heat in the position which passed the contact portion with the belt of a heating roller, By controlling so that the temperature of this portion is maintained uniformly, belt temperature which rushes into a nip part can always be made regularity, and fixing stable regardless of the temperature state of the above-mentioned pressurizing roller etc. is attained.
[0055]In this example, since the calorific capacity of a belt is small, if a belt begins to touch a recorded material, heat will begin to be taken by the recorded material, when passing and leaving a nip part, potential equivalent temperature falls, and it will be in the state where a toner does not carry out hot offset.
[0056]Since many of magnetic flux of the above-mentioned explanation will pierce through this and even a heating roller will attain them if that thickness is very small although a part of generation of heat is generated by this belt if metal is used instead, although resin constituted the belt from this example, the same operation of self-temperature control etc. can be made to perform.
[0057]Since an exiting coil and a core material can be installed in the belt exterior while an exothermic part is in the inside of a belt in this example, in response to the influence of the temperature of an exothermic part, it is hard to carry out temperature up of the exiting coil etc., and calorific value can be kept stable.
[0058]Although the heating roller 44 and the electric conduction roller 45 were made to estrange thermally and were constituted from this example, even if it sticks these, these self-temperature control characteristics are acquired similarly. In this case, the calorific capacity as a heating roller part becomes a little large, and that part warm-up time starts for a long time.
[0059]Next, the image heating device of the 2nd example is explained using drawing 10.
[0060]In the 2nd example, the portion which carries out the same role with the same composition as the anchorage device of the 1st example gives the same ****, and omits the detailed explanation.
[0061]44 is a heating roller and is 0.4-mm-thick iron and nickel. It comprises a magnetic material which becomes with the alloy of chromium, and it is adjusted and manufactured so that the Curie point may be 250 degrees. The diameter of the heating roller 44 is 30 mm, and in order to give a mold-release characteristic to the surface, the releasing layer with a thickness of 15 micrometers of a fluoro-resin is covered. As a surface releasing layer, good resin and rubber of a mold-release characteristic of PTFE, PFE, FEP, silicone rubber, fluorocarbon rubber, etc. may be covered with independent or mixing. Although what is necessary is to secure only a mold-release characteristic as a fixing assembly for monochrome pictures, to use as a fixing assembly for color pictures, giving elasticity needs to form a desirable and in that case a little thick rubber layer.
[0062]The litz wire which bundled the thin line is used, 23 is an exiting coil as a magnetizing means, sectional shape is formed so that the heating roller 44 may be covered like drawing 10, and the core material 24 which comprised a ferrite is installed in a part of center and back. Like the 1st example, along with the main core material 24, it is mostly formed covering the overall length, and the exiting coil 23 is constituted so that it may supplement with the magnetic flux of the heating roller 24 which the core material 24 on the back is accepted in part, exists, and leaks outside. 25 to 30-kHz alternating current is similarly impressed to the exiting coil 23 from the exciting circuit 25.
[0063]By the section abbreviation semicircular state which has the arc part 45a which

opened the heating roller 44 and a 0.5-mm crevice, the conductive member 45 which becomes with aluminum whose conductivity is higher than said heating roller 44 is formed in the inside of the heating roller 44. The conductive member 45 is supported with the axis 46, enabling free rotation, a phase with said exiting coil 23 is fixed to a position, and the phase has composition which can be changed by the switching means 53.

[0064]In drawing 11, the length of the cross direction of the conductive member 45 corresponds to the position which the non recording material 15 passes, and is formed in the both ends of said axis 46 from the outside of the minimum width of said recorded material 15 covering the almost same length as the central heartwood 24.

[0065]It is difficult for the heat which the heating roller 44 and the conductive member 45 were supported by the flanges 47 and 48 which comprised small heat-resistant resin of heat conduction of bakelite etc. in both ends, and was generated with the heating roller 44 to get across to the conductive member 45.

[0066]The heating roller 44 is supported by the bearing 51, enabling free rotation, and is rotated by the driving means of the device main frame which is not illustrated.

[0067]Again, in drawing 10, the pressurizing roller 49 comprises silicone rubber of low hardness (30 JISA), is welded by pressure to the heating roller 44, and forms nip. The pressurizing roller 49 was supported pivotable by the follower around the metallic shaft 50. The construction material of the pressurizing roller 44 may be constituted from heat resistant resin and rubbers, such as other fluorocarbon rubbers and a fluoro-resin, and may consist of foam. In order to improve abrasion resistance and a mold-release characteristic to the surface of the pressurizing roller 49 furthermore, resin or rubbers, such as PFA, PTFE, and FEP, may be covered with independent or mixing.

[0068]52 detects the skin temperature of the heating roller 44 with a temperature detection sensor -- as -- the shaft orientations of the heating roller 44 -- it is mostly allocated in the center section. The detect output of this thermo sensor 52 is inputted into said exciting circuit 23, and it is constituted so that the electric power supplied to an exiting coil may be controlled.

[0069]This example as well as said 1st example is giving self-temperature control characteristics to this portion with the composition of the above-mentioned exothermic part. The operation is explained below.

[0070]The conductive member 45 is in the state fixed in the arc part 45a with the exiting coil 23 and the phase (the 2nd position) which does not counter, Rotate the heating roller 44 by the driving means which is not illustrated, and exiting coil 23 ** is driven by a 30-kHz alternating current from the frequency 25 by the exciting circuit 25, When generation of heat is started (non-normal operation), the exothermic part 44a which countered the exiting coil 23 of the heating roller 44 in drawing 5 is in the temperature below a Curie point, and the magnetic flux produced with the exiting coil 23 almost penetrates the inside of the heating roller 44, as shown in the arrow D of a figure, and D', and carries out temperature up of the heating roller 44. in this case -- the conductive member 45 is in a position far from the exiting coil 23 -- that magnetic field -- being almost out of the range, regardless of the shape of the cross direction of said conductive member 45, most magnetic flux penetrates the inside of the heating roller 44. If it detects that temperature up of the heating roller 44 was carried out, and temperature up was carried out by the output of the thermo sensor 52 to a predetermined temperature (it is

190 degrees in the case of this example), After that, the output is controlled so that the exciting circuit 25 maintains the skin temperature of the heating roller 44 to a predetermined temperature, and the skin temperature of the heating roller 44 is maintained by prescribed temperature. Even if the temperature of a heating roller goes up, like drawing 7, until the thermo sensor 52 detects a predetermined temperature Since the arc part 45a of the conductive member 45 and the distance of magnetic flux of the exiting coil 23 are far, That is, there is almost no magnetic flux of the magnetic field by the exiting coil 23 which is almost out of the range and passes along the conductive member 45 like the arrow E of a figure and E', therefore most eddy currents flow through the inside of the heating roller 44, a heating rate hardly changes, either, and temperature up of the heating roller 44 is carried out almost uniformly covering magnetization width. When the thermo sensor 52 detects a predetermined temperature, it will be in a normal operation state and the arc part 45a of said conductive member 45 is changed to said exiting coil 23 and the position (the 1st position) which counters by the switching means 53.

[0071]Turned up the field which has the toner 35 in the recorded material 15 of the minimum width which had the toner image transferred as shown in drawing 10, it was made to rush into the anchorage device constituted as mentioned above continuously from the direction of the arrow F with the image forming device of drawing 12, and the toner on the recorded material 15 was established.

[0072]Electric power is supplied, in order for the skin temperature of the portion which the recorded material 15 passed to fall, to detect the temperature by the thermo sensor 52 and for the heating roller 44 to recover a fallen part by the exciting circuit 25. Then, strong magnetic flux flows in order to raise temperature also to both ends other than the portion which the recorded material 15 of the heating roller 44 passed, but. the magnetic flux -- the arrow E of drawing 6, and E' -- most like to said non recording material 15 and the conductive member 45 formed in the corresponding outside of a position, [emit and] the induced current flowed overwhelmingly within the conductive member 45 with high conductivity, when current was restricted uniformly, generating of heat was boiled markedly and decreased, and temperature was stabilized and, in the case of this example, was mostly stabilized at 220 degrees.

[0073]Since, as for recorded material 15 passage part of the heating roller 44, temperature falls, amplitude permeability becomes large from the part both ends and said conductive member 45 has not countered, Magnetic flux penetrates most inside of the heating roller 44 like the arrow D of drawing 5, and D', If it detects the induced current having flowed through the inside of the heating roller 44, having recovered skin temperature, and having recovered with the output of the thermo sensor 52 to a predetermined temperature (it is 190 degrees in the case of this example), After that, the output is controlled so that the exciting circuit 25 maintains the skin temperature of the heating roller 44 to a predetermined temperature, and the skin temperature of the heating roller 44 is maintained by prescribed temperature.

[0074]In this example, start a warm up with the phase (the 2nd position) which does not make the arc part of a conductive member counter an exiting coil (non-normal operation), and it detects that the temperature of the heating roller turned into prescribed temperature, In order to change a conductive member to the phase (the 1st position) which counters an exiting coil (at the time of normal operation), a heating up time hardly changes to the

case where self-temperature control is not carried out, but the safety over breakage by an unusual elevated temperature is ensured.

[0075]In this example, since the conductive member is formed over the magnetization range of a heating roller from the outside of the minimum width of a recorded material, to the heating roller of a portion which the recorded material passed. Since most magnetic flux always penetrates and passes, when much magnetic flux passes through the inside of a heating roller, calorific value also increases more than the case where a conductive member is formed covering overall width and a recorded material passes continuously, Also when the transit rate of a recorded material is quick, temperature recovery of a heating roller is attained and correspondence becomes more possible to a high speed area.

[0076]Since the heating roller itself has self-temperature control characteristics, it acts also to the partial temperature gradient of the depth direction of drawing 10 in this example and the difference of a partial exothermic effect occurs, Since the portion which a recorded material does not pass does not become an elevated temperature unusually and the calorific capacity of a heating roller is small constituted even if it lets a recorded material with narrow width pass continuously, Hot offset is not carried out even if the temperature fall of a heating roller at the time of stopping energization or lessening lets a broad recorded material pass early after that.

[0077]Since there is almost no generation of heat in the position which passed the opposite portion of the exiting coil of a heating roller, By controlling so that the temperature of this portion is maintained uniformly, heating roller temperature which rushes into a nip part can always be made regularity, and fixing stable regardless of the temperature state of the above-mentioned pressurizing roller etc. is attained.

[0078]In this example, the exiting coil and the core material are installed in the exterior of a heating roller, and an exiting coil etc. cannot carry out temperature up easily in response to the influence of the temperature of an exothermic part, and they can keep calorific value stable.

[0079]Although the inside of a heating roller was used with the conductive member and it had composition of an exiting coil outside in the 1st and 2nd examples, it is possible to obtain an exiting coil inside a heating roller and to acquire the effect same also as composition of a conductive member outside.

[0080]In the 1st and 2nd examples, although aluminum was used as a conductive member, the conductive high metal of other copper can also be used. A heating roller can also acquire the effect that other alloys which can set up Curie temperature are the same.

[0081]What is necessary is to be satisfactory in any way, even if it detects change of amplitude permeability, change of current and electric energy, etc., and just to adopt the optimal object in the composition, although the temperature of the heating roller was set up as a detection object of the stage to change the position of a conductive member in the 1st and 2nd examples.

[0082]Although the distance from a heating roller inner surface made the conductive member the section abbreviation semicircular state which has an almost equal arc part in the 1st and 2nd examples, it is possible to acquire the same effect in other shape, such as a sector and a rectangle, although there is a difference of a grade.

[0083]Although opposite and un-countering, and a position (phase) were changed for the exiting coil to the conductive member by the 1st position and 2nd position in the 1st and 2nd examples, even if it changes like [in the case where the distance from a heating

roller is kept away, and the case of bringing close], it is possible to acquire the same effect.

[0084]Although conductive high metal constituted the whole conductive member of section abbreviation semicircular state from the 1st and 2nd examples, it is only a portion which counters with a heating roller and carries out disjunction, and even if a conductive required thing constitutes other portions from other construction material, for example, a synthetic resin etc., it can acquire the same effect.

[0085]Although the 1st and 2nd examples explain the image heating device of a monochrome picture, it is usable enough also as an image heating device of a color picture by changing a hair side of belt side or the surface of a roller.

[0086]

[Effect of the Invention]Warm-up time until it is possible to warm by this invention quickly as mentioned above since the calorific capacity of the heating roller which is the belt and heating element which are heating bodies can set up very small and it reaches fixing temperature is made very small. Even if it sets up the calorific capacity of a heating roller small, the temperature of a heating roller can be low set up by generation of heat by a belt contact portion.

[0087]By setting up more greatly than a skin depth, the thickness of a heating roller can perform uniform uniform generation of heat.

[0088]Without the portion along which a recorded material does not pass carrying out overheating, even if it furthermore lets a recorded material with narrow width pass continuously with the stable temperature control by self-temperature control, Hot offset cannot be started, calorific value does not become unstable, and breakage by the heat of an exiting coil etc. can be prevented.

[0089]Also about the increase in the warm-up time due to the fall of calorific value [/ near the Curie point] for self-temperature control. By changing, when changing the phase of a conductive member and sending an induced current through a conductive member, and when making it concentrate on a heating roller, it can press down to the minimum and warm-up time almost equivalent to the case where self-temperature control is not performed can be acquired.

[0090]Since a magnetizing means and a core material can be installed in the belt exterior, the calorific value stabilized without exposing a magnetizing means, a core material, etc. to an elevated temperature can be obtained.

[Translation done.]